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UNPUBLISHED PRELIMINARY DATA

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Contractor

New Mexico State University
University Park, New Mexico

(NASA CR-52850) OTS:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Title

CONTINUED PHOTOGRAPHIC PATROL AND STUDY
OF THE
PHYSICAL CONDITIONS ON THE MOON AND PLANETS

(NASA Grant NsG-142-61)

Period
15 April 1963 to 14 October 1963

OTS PRICE
XEROX $ 1.10 ph
MICROFILM $ 0.80 mf

Clyde W. Tombaugh [1963]
Principal Investigator

0 refs

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1. Summary of Work

1.1 Observations

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During most of this period, both Venus and Mars were unfavorably placed for effective observation. Saturn was quiescent as evidenced by scarcely any change of markings on the disk. On the other hand, Jupiter was extremely active with many rapid changes in the markings, which were well observed under the very favorable circumstances of a perihelion opposition--occurring once in 12 of our years.

Author

1.1.1 Venus

Photographic observations were made of Venus on 25 days. A total of 47 plates was taken, all in ultraviolet light, with the 12-inch Fecker telescope at the 66-foot cassegrain focus on 3 1/4 x 4 1/4-inch Eastman spectroscopic plates. Nearly all plates contain 63 planetary images each.

1.1.2 Mars

Photographic observations were made of Mars with the same facilities. Eighty-one plates were taken on 23 nights, of which 30 plates were taken in blue light, 23 plates in green light, 17 plates in red light, and 11 plates in ultraviolet light.

Visual observations were made of Mars by Tombaugh with his own (f 10) 16-inch telescope at the Newtonian focus on 23 nights, generally with a magnification of 400 diameters. These observations supplement the photographic, since finer details can be studied visually.

1.1.3 Jupiter

During the latter half of this period, Jupiter was well placed for observation. Perihelion opposition occurred in early October, at which time the planet's disk subtended the largest angle in 12 years. Extraordinary activity and changes are occurring on Jupiter at this time. Consequently, a vigorous photographic and visual program is in progress. A summary of the 413 plates taken on 89 nights follows:

Blue light	140
Red light	129
Green light	124
Ultraviolet light	4

In addition 8 films were taken on commercial Ektachrome. These plates were taken with the 12-inch Fecker telescope.

A concurrent program of visual observations of Jupiter was undertaken with a 16-inch telescope. The observations were made principally by Reese. Voluminous notes were taken on the colors, pattern and distribution of active areas, as well as their changes in appearance. From 2 June to 14 October 1963, Reese has observed 1,171 central meridian transits of 86 spots. Tombaugh visually observed five C. M. transits of the Red Spot with his 16-inch telescope.

1.1.4 Saturn

This planet has been favorably situated during this period. Saturn has been quiescent, and only 13 plates were taken within the period. However, Tombaugh has maintained a visual patrol with his 16-inch reflector at the Newtonian focus to watch for any outbreak of activity.

1.1.5 Asteroid No. 1580

A total of 35 plates was taken of this asteroid with the Fecker telescope, but they have not been measured.

1.1.6 Miscellaneous

A total of 52 plates was taken of other objects.

1.2 Reduction of Data and Studies

1.2.1 Venus

Reproduction techniques for the Venus photographic atlas are currently being investigated. A diameter derived from inferior conjunction photographs was reported at the 114th meeting of the American Astronomical Society. Measurements of the haze layer above the cloud cover on Venus were in progress during this period.

1.2.2 Mars

Robinson completed his analysis of the 1960-1961 Mars apparition plates. These studies were summarized in a paper and submitted for publication in August (See section 2.2, Publications). Emphasis was given to a study of the blue clouds, blue clearings, atmospheric belts, and the activity in the Tharsis-Amazonis Region. During the last two months of this period, Robinson was engaged in the analysis of the 1962-1963 Mars apparition plates.

During this period, Tombaugh began a study of observational data he had obtained visually over the past thirty years and obtained evidence of faulting

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in various places in the crust of Mars. He compiled new maps of Mars that portray details within the maria and features of their boundaries which yield provisional evidence for faulting in many places. This study was briefly summarized in a paper read before the 114th meeting of the American Astronomical Society.

Tombaugh examined criteria for working out a crude topographic map of Mars. There appears to be reasonable evidence for dividing the martian surface into ten levels of altitude. Compilation of a topographic map of Mars is in progress.

Tombaugh and Robinson attended the Symposium on "The Exploration of Mars" in Denver 6-7 June 1963, in which discussion contributions were made. Tombaugh was requested to serve on the final panel session. He furnished solicited recommendations for landing sites on Mars.

1.2.3 Jupiter

Reese was engaged in reducing his voluminous transit observations of spots for rotational periods and plotting drifts in longitude, with respect to Ephemeris Systems I and II. Also, he measured geographical coordinates for many markings from the Jupiter photographs.

2. Publications

2.1 Bradford A. Smith prepared and submitted a paper entitled, "An Optical Radius of Venus from Photographs Taken at Inferior Conjunction" (See Section 1.2.1). A resume of this paper was requested by Sky and Telescope which appeared in Vol. XXVI No. 4, October 1963.

A more detailed and formal paper has been prepared for publication in another journal.

2.2 Smith's paper entitled "Photographic Appearance of Venus at the Time of Mariner 2 Encounter" was published in the Journal of Geophysical Research, Vol. 68, No. 14, July 15, 1963, pages 4363-4365.

2.3 Robinson submitted a paper entitled "Photographic Observations of Mars at New Mexico State University in 1960-1961" for publication.

2.4 Tombaugh submitted an observatory annual report of the work undertaken at this institution during the past year to the Astronomical Journal, which was accepted for publication.

2.5 Tombaugh submitted a paper entitled "Evidence of Faulting in the Crust of Mars--Part I Grabens".

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3. Instrumentation

Construction of the spectro-photometer is nearly completed.

4. Personnel

4.1 Dr. C. W. Tombaugh has continued on half-time teaching status at New Mexico State University, except for full-time research during the summer. He has served as co-supervisor of the present research project.

4.2 Mr. B. A. Smith has continued full-time as co-supervisor, and is in charge of all photographic investigations at the 12-inch Fecker telescope.

4.3 Mr. J. C. Robinson has continued full-time on the reduction and study of martian atmospheric phenomena recorded on the photographic plates.

4.4 Mr. A. S. Murrell has continued as Chief Technician (Chief Observer).

4.5 Messrs. R. Fritz, J. Hartsell, and E. Reese are technicians working full-time. Reese joined the staff in July to replace T. Bruce.

4.6 Mr. C. Mozer continued as assistant physicist.

4.7 Messrs. W. Bains, T. Kirby, and C. Richey are part-time students assisting in the work.

[redacted]